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New poly aniline-based potentiometric biosensor for pesticides detection

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Abstract

A cholinesterase potentiometric sensor based on a glassy carbon electrode modified with processible polyaniline has been developed and explored for the detection of organophosphorus and carbamic pesticides. Acetyl- and butyryl-cholinesterase from various sources were immobilized on the surface of a polyaniline modified electrode by cross-linking with glutaraldehyde. Polyaniline modification made it possible to obtain a reversible pH response of about 86-mV/pH unit and to improve the analytical and operational characteristics of substrate and inhibitor detection. The sensitivity of pesticide detection depends on both the source of the enzyme and its activity and on pesticide hydrophobicity. The detection limits of the pesticides investigated (Trichlorfon, 1.5 · 10-7 mol/l, Coumaphos, 5 · 10-9 mol/l, Methio-carb, 8 · 10-7 mol/l, Aldicarb, 2 · 10-7 mol/l) were found lower than those obtained with other similar cholinesterase sensors. The possibility for the detection of the trace amounts of pesticides in river waters and grape juice with cholinesterase sensors developed has been established on model samples.

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Keywords

Cholinesterase, Inhibition, Pesticide, Polyaniline, Potentiometric biosensor